

:]bUbn_f]gY`XYf`; ?J`i bX`GDJ. JYfVÀbXY`ZcfXYfb`Xf]b[YbXY`@Ògi b[Yb

/`h/d/[h//`h/ghfcb[/[h/A YhU!
6YgWXfY]Vib[./`h/#ghfcb[/[h//`hWf'#/[h/
9fZU\fYb'G]Y']b'i bgYfYa '5fh]_Y``ØVYf'X]Y'U`Ufa]YfYbXY
:]bUbn`U[Y'XYf'; YgYhn`]WXYb'?fUb_Yb!'i bX
DZY[Yj Yfg]WXYfi b[']b'8Yi hgWX`UbX"'J YfVAbXY'ZcfXYfb
Xf]b[YbX'A U» bU\a Yb'j cb'XYf'6i bXYgfY[]Yfi b[ž'i a 'X]Y
6Y`Ughi b[Yb'ZØf'JYfg]WXYfhY'i bX'5fVY]h[YVYf'ni 'fYXi n]YfYb
i bX'X]Y'GhUV]`]hAh'XYg'Gcn]U`ghUUhYg'ni 'g]WXYfb"'@YgYb'G]Y
a Y\f'ØVYf'X]Y'bchk YbX][Yb'FYZcfa Yb'i bX'X]Y
5i qk]f_i b[Yb'Ui Z'X]Y'6Y]hfU[qqAhnY"/`h/#d/[h/



? UggYbj YfVÀbXY'k UfbYb'j cf'Z]bUbn]Y``Yf GWX]YZ`U[Y'XYf'Gcn]U`j Yfg]WXYfi b[ggmghYa Y

Gcn]U`Yb`DZY[YjYfg]W\Yfib[`fGDJ \L''', VYf'+(`A]``]cbYb`AYbgW\Ybg]bX'jcb'X]YgYb`GmghYaYb`VYhfcZZYbžibX'X]Y`Xfc\YbXYlbhYfZ]bUbn]Yfib[`_ÒbbhY`Yf\YV`]W\Y':c`[Yb`ZØf']\fY@Y]ghib[gZÀ\][_Y]h`\UVYb"

8]Y'8f]b[`]W_Y]h'X]YgYf': cfXYfi b[Yb'k]fX'VYgcbXYfg'XYi h']W\']b
6Yni ['Ui Z'X]Y'VYgW\`cggYbY'?fUb_Yb\Ui gghfi _hi ffYZcfa "
6i bXYg[Ygi bX\Y]hga]b]ghYf'?Uf``@Ui hYfVUW\'\Uh'VYfY]hg
Y]b[YghUbXYbž'XUgg'X]Y'FYZcfa 'X]Y'6Y]hfU[ggÀhnY'k Y]hYf'VY`UghYb
k]fX"'8]Yg'ZØ\fh'ni f'6Ygcf[b]gž'XUgg'X]Y'Z]bUbn]Y``Y'@W_Y
nk]gW\Yb'9]bbU\a Yb'i bX'5i g[UVYb'XYf'[YgYhn`]W\Yb
?fUb_Yb_UggYb'k Y]hYf'k UW\gYb'k]fX"': Øf'XUg'\J\f'&\\$\)
dfc[bcgh]n]YfYb'X]Y'?UggYbj YfV\AbXY'Y]bYb'ni g\Am`]W\Yb
:]bUbnVYXUfZ'j cb'\\$\z\)'V]g'\\$\z\+'6Y]hfU[ggUhndi b_hYb\z'k Ug'ZØf'j]Y`Y
J Yfg]W\YfhY'Y]bY''\A\f`]W\Y'A Y\fVY`Ughi b['j cb'V]g'ni '\&\+'9i fc
VYXYi hYh''

6YgcbXYfg'_f]h]gWX']gh'X]Y'G]hi Uh]cb']b'XYf'DZY[Yj Yfg]WXYfi b["Hfchn'XYf''Øb[ghYb'FYZcfa a U» bU\a Yb'nY][h'g]WX'Y]bY'Z]bUbn]Y'`Y \dightarrow ghUV]`]h\and h\zeta'i bX'X]Y'DZY[Y_UggYb'fYWXbYb'ZØf'XUg'_ca a YbXY \dightarrow \frac{1}{2}\text{bub'} a \frac{1}{2}\text{bub'}

 $8 \ Yg'K \ Y]hYfYb'ZcfXYfb'X]Y'? \ UggYbj \ YfVAbXY'Y]bY'F \ \emptyset W_Y \ Y'ni$

Y]bYf'5i g[UVYbdc`]h]_ž'X]Y'XYb'fYU`Yb'9]bbU\a Yg]hi Uh]cbYb
[YfYW\h'k]fX"'<]YfVY]'_ObbhY'Y]bY'GYb_i b['XYf'A Y\fk YfhghYi Yf
Ui Z'5fnbY]a]hhY`'j cb'%-'Ui Z'+'DfcnYbh'Y]bY'k YgYbh`]W\Y
9f`Y]W\hYfi b['XUfghY``Yb"

8]Y 'ZcfhgWk fY]hYbXY':]bUbn_f]gY']b'X]YgYb'6YfY]Wk Yb'\Uh'b]Wk h'bi fi ba]hhY`VUfY'5i gk]f_i b[Yb'Ui Z'X]Y'J Yfg]Wk YfhYbž'gcbXYfb']gh Ui Wk'Y]b'NY]Wk Yb'ZØf'h]Y ZYfY'ghfi _hi fY``Y'DfcV'Ya Y']a 'XYi hgWk Yb Gcn]U`j Yfg]Wk Yfi b[ggmghYa "'8]Y'J YfUbhk cfhi b[ž'bUWk\U`h][Y @Ògi b[Yb'ni 'Z]bXYbž'`]Y[h'b]Wk h'bi f'VY]'XYb'J YfVÀbXYbž'gcbXYfb Ui Wk'VY]'XYf'Dc`]h]_"'9]b'gmghYa Uh]gWk Yg'<UbXY`b']gh'YfZcfXYf`]Wk ži a 'XUg'J YfhfUi Yb'XYf'6Øf[Yf']b'X]Y'gcn]U`Yb'G]Wk Yfi b[ggmghYa Y Ui ZfYWk hni Yf\U`hYb"

8]Y'U`Ufa]YfYbXYb'9bhk]W_`i b[Yb']b'XYf'; ?J'i bX'GDJ'nY][Ybž XUgg'c\bY'fYW\hnY]h][Y'\delta\hYfjYbh]cbYb'X]Y'GhUV]`]h\h'X]YgYf nYbhfU`Yb'GmghYa Y'XYg'XYi hgW\Yb'Gcn]U`ghUUhYg'[YZ\h'X]Ygh']gh'' Gc``hY'X]Y'6i bXYgfY[]Yfi b['b]W\h'ni 'Y]bYa '\UbX`i b[gZ\h'][Yb 5bgUhn'Z]bXYbž'_\ObbhY'X]Yg'Z\Of'Y]bY'J]Y`nU\`'j cb'JYfg]W\YfhYb gW\kYfk]Y[YbXY'?cbgYei YbnYb'\UVYb'''9g'V`Y]Vh'ni '\cZZYbž'XUgg X]Y'JYfUbhk cfh`]W\Yb'X]Y'8f]b['`]W_Y]h'X]YgYf'H\Ya Yb UbYf_YbbYb'i bX'nY]hbU\''9bhgW\Y]Xi b[Yb'hfYZZYbž'X]Y'X]Y dc`]h]gW\Yb'i bX'gcn]U`Yb'K Y]W\Yb'Z\Of'X]Y'Ni _i bZh'ghY``Yb''

8 Y hU]`g

6Yqi WXYb G]Y i bq Ui Z. a Y]b!VYf`]b bYh